تم الرفع بواسطة م.معن أبو عيسى

Circuit 1 Lab midterm

ENGINEERING

CIRCUIT1 LAB

السلطة الوطنية الفلسطينية

جامعة فلسطين التقنية طولكرم "خضوري"

first exam 2010/2011

التخصص والمستوى :

اسم المساق :

تاريخ الامتحان : 1/12/2010

زمن الامتحان : 60min

م.محمود الاحمد

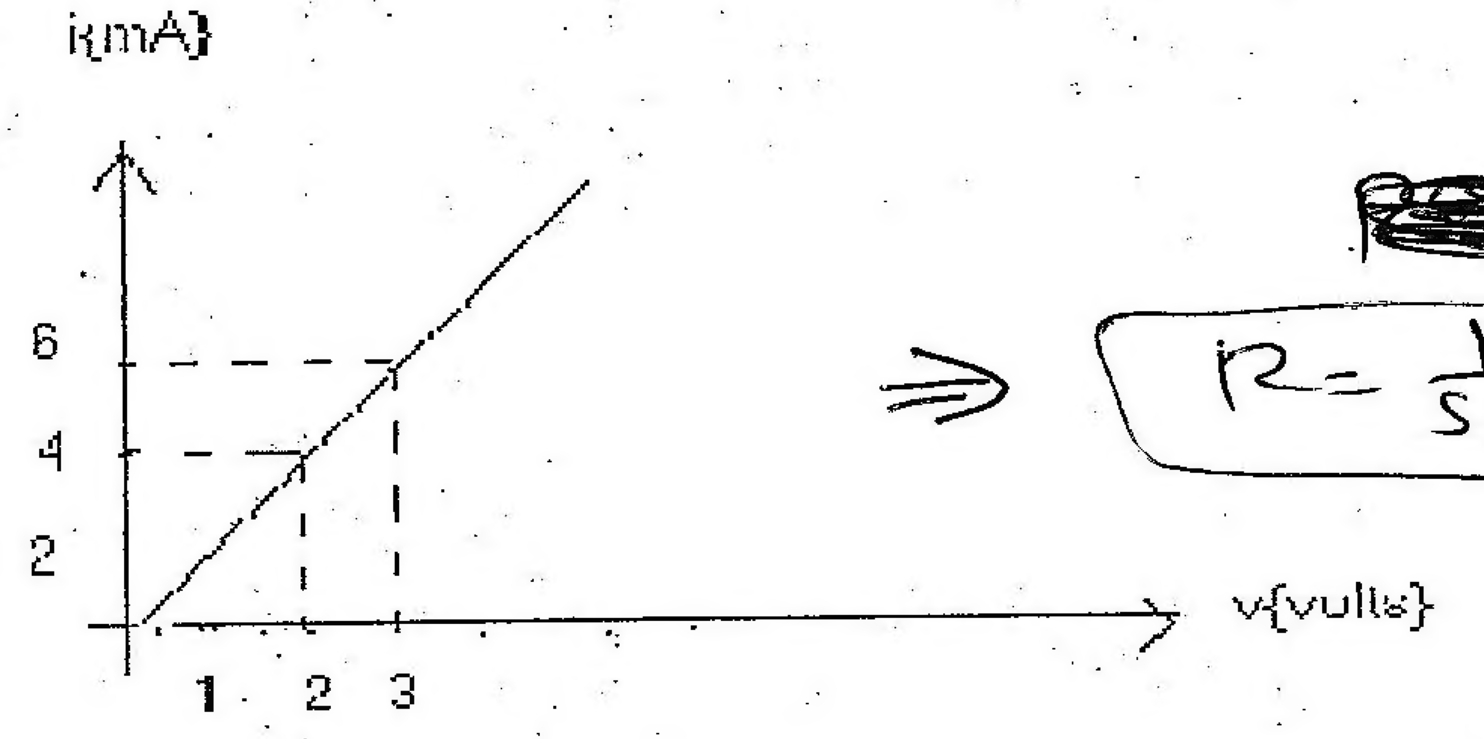
11/15

الاسم : معن سلام قفدان

الشعبة : ارشاد 2 - 5

العلامة $\frac{11}{15}$

Q1) The v-I characteristics of a linear resistor is shown below . find R



$$\Rightarrow \boxed{R = \frac{1}{Slope}} \Rightarrow Slope = \frac{6-4}{3-2} = \frac{2}{1} = \boxed{2}$$

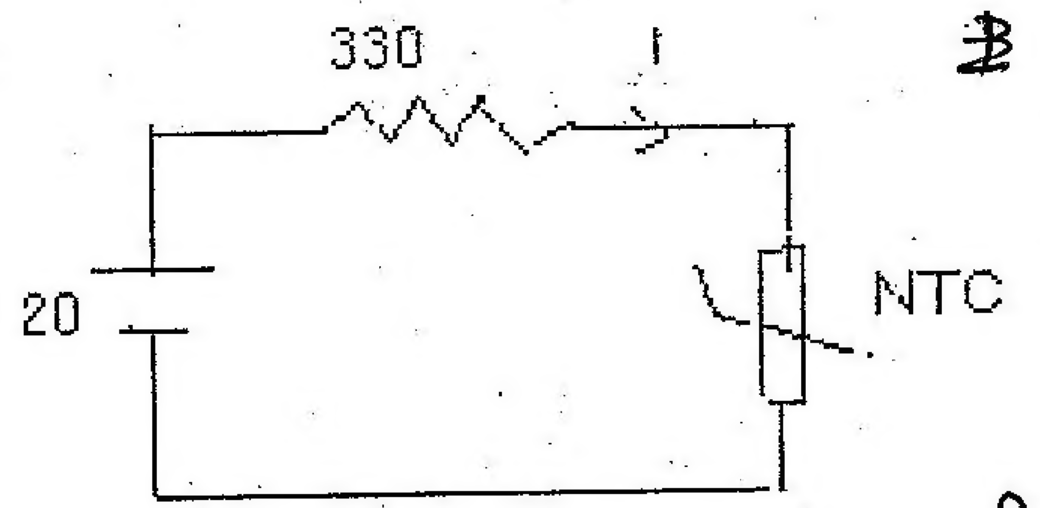
$$\therefore R = \boxed{\frac{1}{2}} \times 10^3 = \frac{1000}{2} = \boxed{500\ \Omega}$$

$$\therefore R = \frac{3}{6\times10^{-3}} = \frac{1}{2}\times 10^3 = 500\ \Omega$$

R= 500 Ω

1

Q2)In the circuit shown below the NTC is connected in series with 330Ω resister .If the current flow stabilizes at 4m A .Find the value of the resistance of the NTC R_{NTC} &the total resistance of the circuit(R_{TOT})



$$V = I\,R_{eq}$$

$$R_{eq} = \boxed{330 + R_{NTC}}$$

RTOT= 5 kΩ	
RNTC= 4.67 kΩ	

2

$$\therefore 20 = 4\times10^{-3}\,(330 + R_{NTC})$$

$$\Rightarrow 330 + R_{NTC} = \frac{20}{4\times10^{-3}} = 5\times10^3 = \boxed{5000\ \Omega} \Rightarrow$$

$$\therefore R_{NTC} + 330 = 5000$$

$$\Rightarrow R_{NTC} = 5000 - 330 = \boxed{4.67\ k\Omega}$$

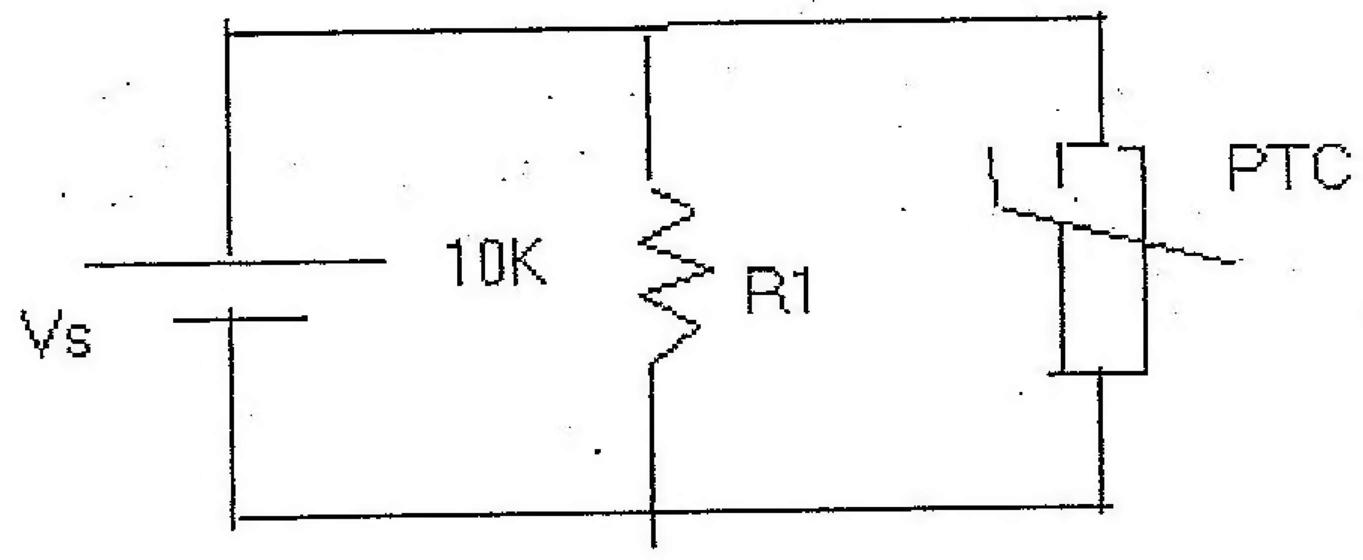
$$\Rightarrow R_{ToT} = 330 + 4670 = 5000 = \boxed{5k\Omega}$$

Q3)At ambient temperature of 18 c˚ the parallel circuit of PTC and R1 Loads the voltage source with a total resistance of 5KΩ.What is the value of PTC resister at this temperature

RPTC= 10 kΩ

1

$$\therefore R_{eq} = 5\ k\Omega$$



$$\therefore R_1 \parallel R_{PTC} = 5\ k\Omega$$

$$\frac{R_1 R_{PTC}}{R_1 + R_{PTC}} = 5k\Omega$$

$$\frac{10 R_{PTC}}{10 + R_{PTC}} = 5 \Rightarrow 5(10 + R_{PTC}) = 10 R_{PTC}$$

$$50 + 5R_{PTC} = 10 R_{PTC} \Rightarrow$$

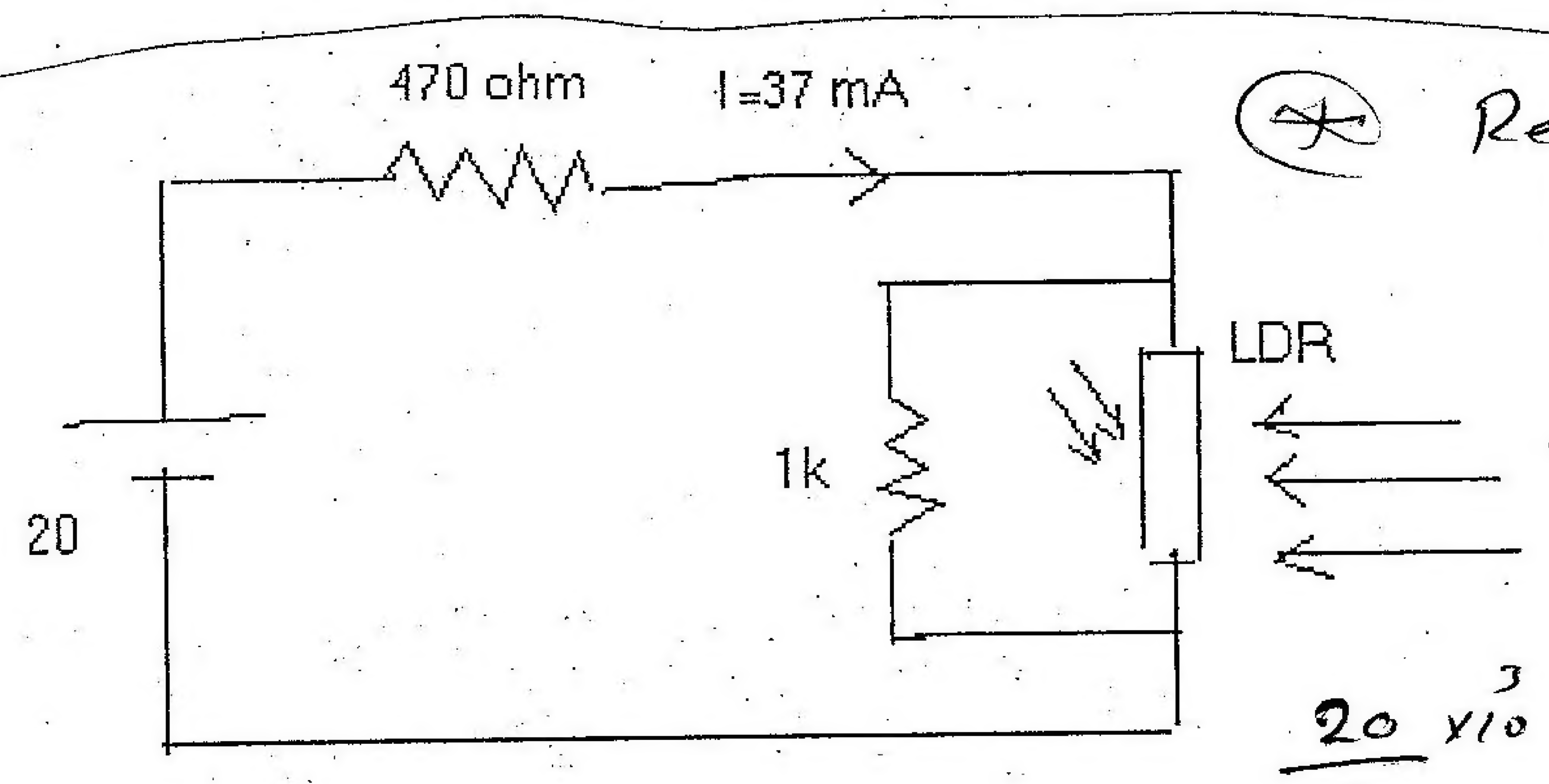
$$50 = 5R_{PTC} \Rightarrow R_{PTC} = \frac{50}{5} = \boxed{10k\Omega}$$

Q4)In the circuit shown below the LDR is connected in parallel with 1kΩ resister .When the light beam is maximum it was found the total current in the circuit I_{tot}=37 m.A . In dark it was found that the LDR is open circuit Find the minimum value of the LDR resistance R_{LDRM}. & the maximum &minimum voltage across the LDR.

$$V_{min} = V_s \frac{1}{1+1} = 20\left(\frac{1}{2}\right) = 10\,V$$

$$V_{max} = V_s(1) = 20(1) = 20\,V$$

RLDRM=	1 kΩ
Vmax=	20 V
Vmin=	10 V



$$R_{eq} = 470 + (1 \parallel R_{LDR})$$

$$R_{eq} = 470 + \frac{R_{LDR}}{1+R_{LDR}}$$

$$\therefore 20 = 37\times10^{-3}\left(470 + \frac{R_{LDR}}{1+R_{LDR}}\right)$$

$$\frac{20\times10^{3}}{37} = 0.470 + \frac{R_{LDR}}{1+R_{LDR}}$$

$$\Rightarrow 540.5 = 0.470 + \frac{R_{LDR}}{1+R_{LDR}}$$

$$540 = \frac{R_{LDR}}{1+R_{LDR}} \Rightarrow 540(1+R_{LDR}) = R_{LDR}$$

$$\cancel{70.5 + 70.5 R_{LDR} = R_{LDR} \Rightarrow 70.5 \Rightarrow R_{LDR} = 70.5}$$

$$540 + 540 R_{LDR} = R_{LDR} \Rightarrow 540 = -539 R_{LDR} \Rightarrow R_{LDR} = \frac{540}{-539} \approx \boxed{1\,k\Omega}$$

Q5)For the circuit shown below if the voltmeter reading is 5 Volts .Find I , I1, I2 ,V1 , V2 , V3

I1=	1.84 mA
I2=	1.58 mA
I=	3.5 mA
V1=	3.16 V
V2	1.84 V
V3	~~0.52 V~~ -1.8 V

I_3

$$2000 I_3 + 6 - 2000(1.58\times10^{-3}) = 0$$

$$2000 I_3 + 6 - 3.16 = 0$$

$$I_3 = \frac{-2.84}{2000} = \boxed{-1.42\text{ mA}}$$

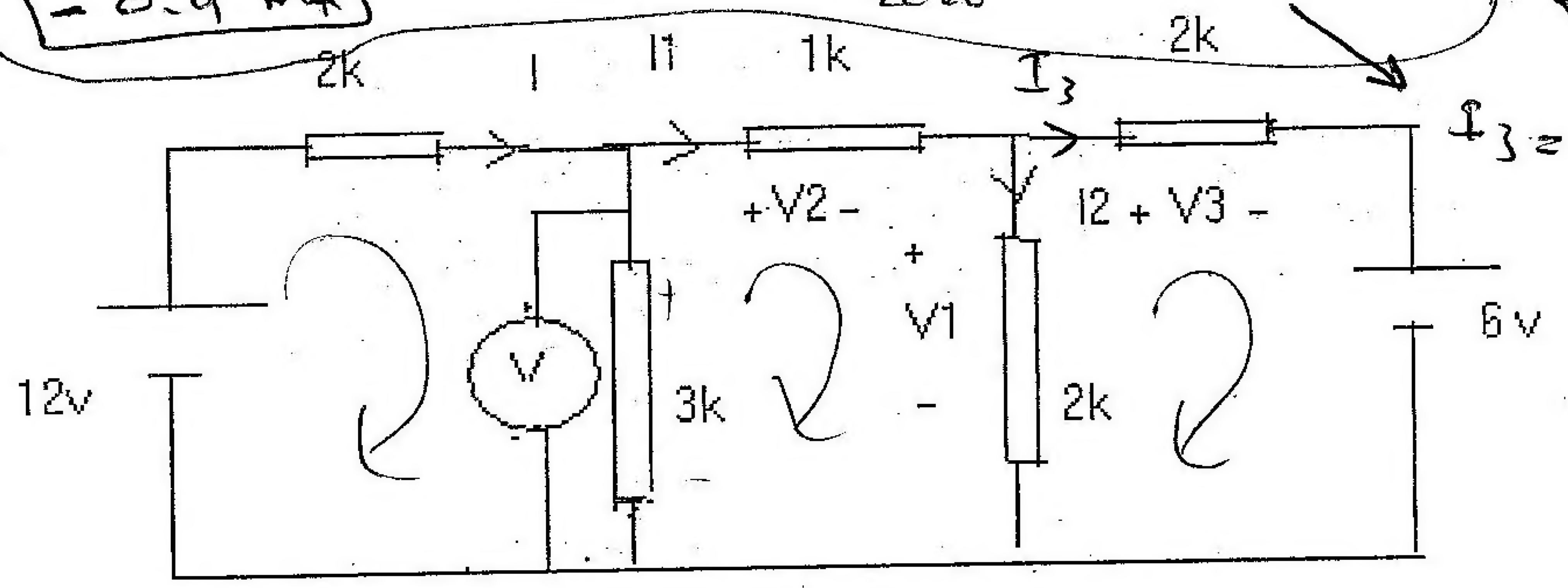
$$I_3 = -1.42 + 0.52$$

$$\boxed{-0.9\text{ mA}}$$

$V = 5$ Volts $\Rightarrow V = IR$

$$5 = I(3000)$$

$$\Rightarrow I = \frac{5}{3000} = \boxed{1.66\text{ mA}}$$



$$I_3 = -1.42 + 0.52 = \boxed{-0.9\text{ mA}}$$

Loop 1 $\quad -12 + 2I + 3000(1.6\times10^{-3}) = 0$

$$\cancel{-12 + 2I + 5 = 0 \Rightarrow 2I = 12 - 5 \Rightarrow 2I = 7 \Rightarrow I =}$$

$$\Rightarrow -12 + 2000 I + 5 = 0 \Rightarrow 2000 I = 7$$

$$\Rightarrow I = \frac{7}{2000} = \boxed{3.5\text{ mA}}$$

$$\boxed{I_1 = 3.5 - 1.66 = 1.84\text{ mA}}$$

Loop 2 : $-5 + 1000 I_1 + 2000 I_2 = 0$

~~Loop 3 2000 I2 + 2000 I3 + 6 = 0~~

$$-5 + 1000(1.84\times10^{-3}) + 2000 I_2 = 0 \Rightarrow -5 + 1.84 + 2000 I_2 = 0$$

$$2000 I = 3.16 \Rightarrow I = \frac{3.16}{2000}$$

$$I_2 = \boxed{1.58\text{ mA}}$$

$$\cancel{I_3 = 1.84 - 1.58 = 0.26\text{ mA}}$$

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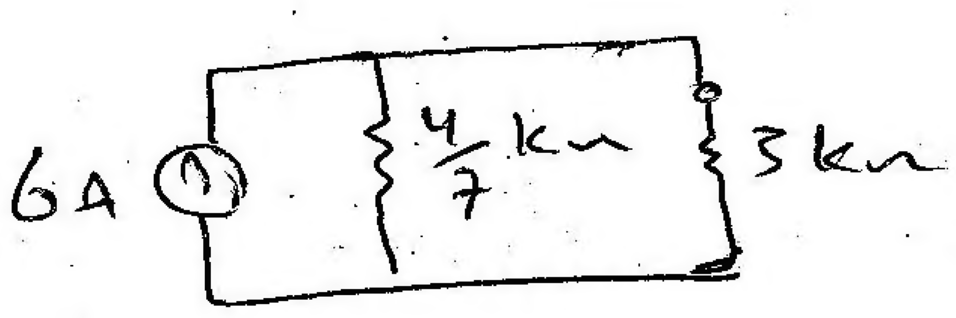
$$\therefore V_1 = I_2(2000) = 1.58\times10^{-3}\times2\times10^{3} = 3.16\,V$$

$$V_2 = I_1(1000) = 1.84\times10^{-3}\times1\times10^{3} = 1.84\,V$$

$$V_3 = I_3(2000) = \cancel{0.26\times10^{-3}\times2\times10^{3} = 0.52\,V} \; -0.9\times10^{-3}\times2\times10^{3} = \boxed{-1.8\,V}$$



⇒ Norton Equivalent

Q6)For the circuit shown below, using Norton theorem find the power of 3kΩ resister

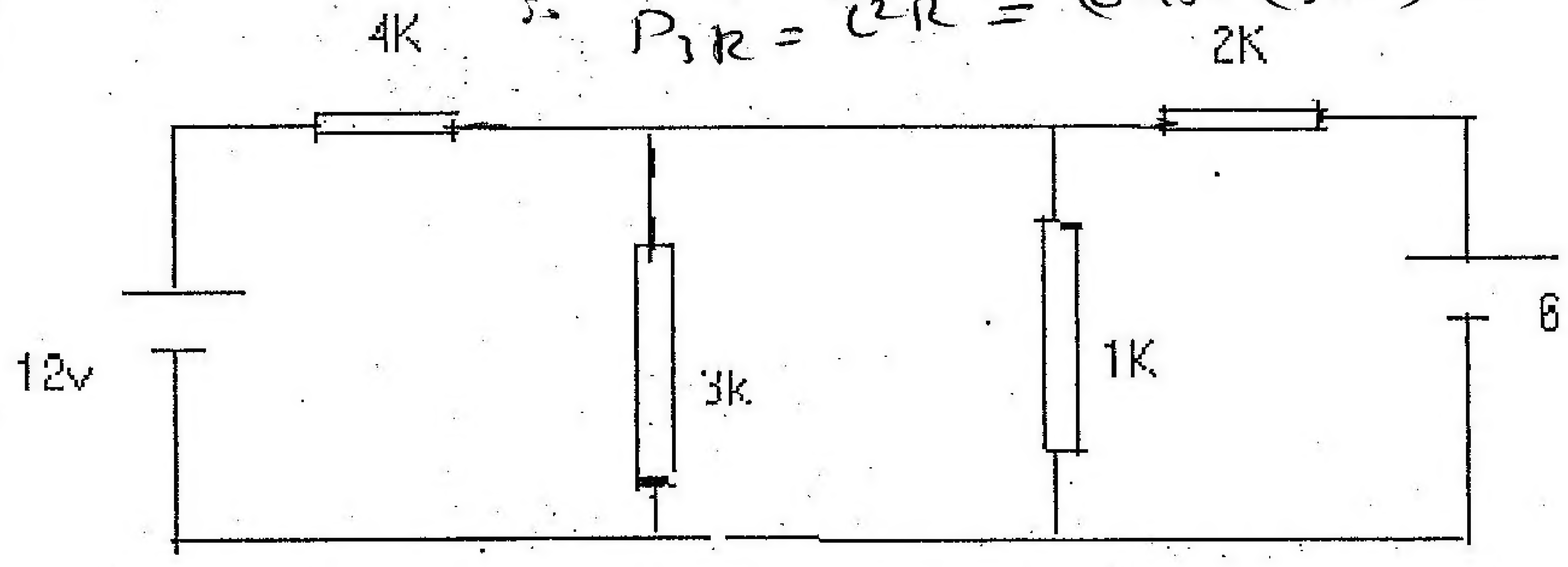
IN=	6 mA
Voc=	9 V
RTH=	$\frac{4}{7}$ kΩ
P3K=	2.7 mW

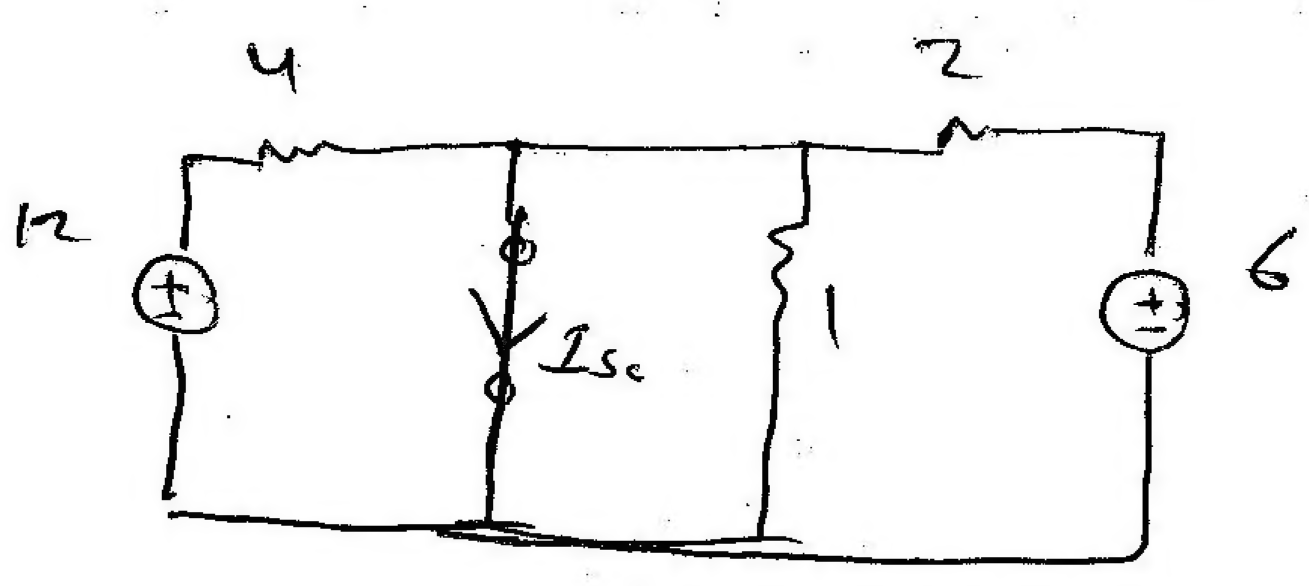
2

$P_{3k} = i^2 R$

$i_{3k} = 6\left(\frac{\frac{4}{7}}{\frac{4}{7}+3}\right) = \boxed{0.95}$ mA

$\therefore P_{3k} = i^2R = (0.95)^2(3000) = 0.9\times10^{-6} \times 3\times10^{3} = 2.7\times10^{-3} \Rightarrow \boxed{2.7 \text{ mW}}$





using super position ⇒ from 12 V ⇒ $I_{sc1} = \frac{12}{4} = \boxed{3}$ mA

from 6 V ⇒ $I_{sc2} = \frac{6}{2} = \boxed{3}$ mA

$\therefore I_{sc} = 3+3 = \boxed{6 \text{ mA}} = I_N$

$R_N \Rightarrow$

$\Rightarrow (1 // 2) // (4) \Rightarrow 1//2 = \frac{1\times2}{1+2} = \frac{2}{3}$

$\frac{2}{3} // 4 = \frac{\frac{2}{3}\times4}{\frac{2}{3}+4} = \frac{\frac{8}{3}}{\frac{14}{3}} = \boxed{\frac{4}{7}}$ kΩ

V_{oc1} (from 12 V) = 12 V | V_{oc2} (from 6 V) $= 6\left(\frac{1}{1+2}\right) = 3$ V

$\Rightarrow \boxed{V_{oc} = 12 - 3 = \boxed{9 \text{ V}}}$

Q7)Use superposition to find I in the circuit below

I' from 12 V Source

I'' from 6 V Source

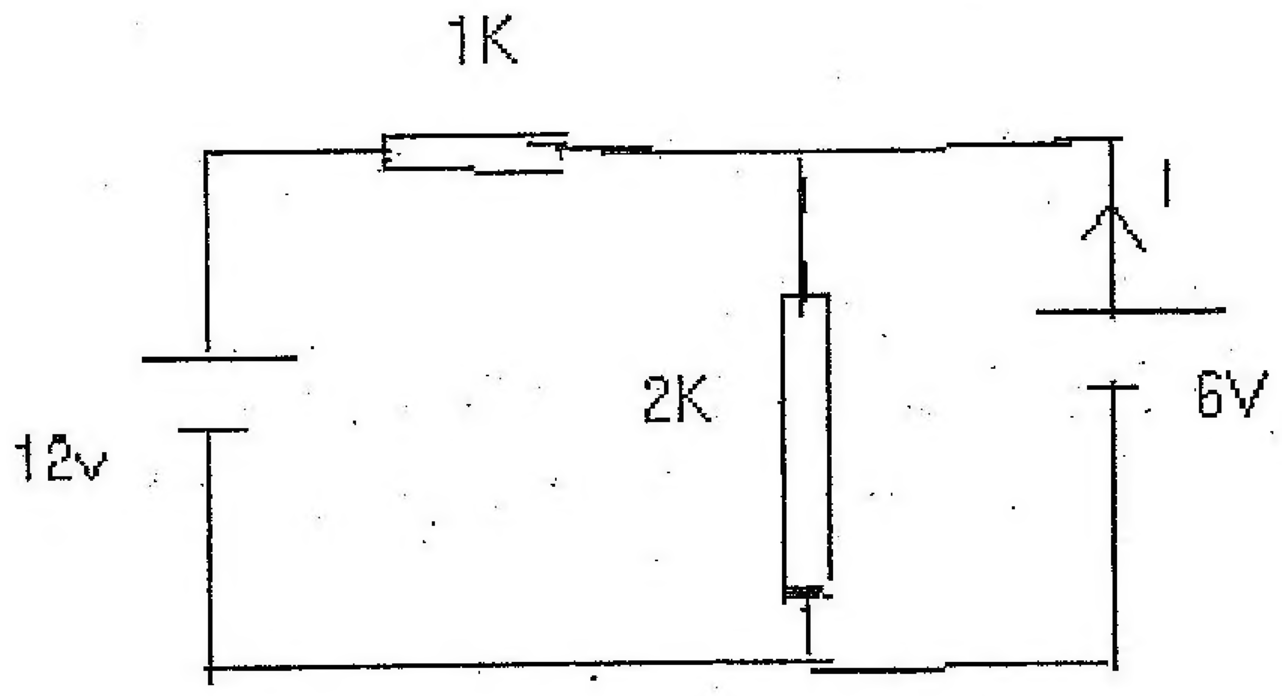
I'=	−12 mA
I''=	9 mA
I=	−3 mA

2

$I' = \frac{12}{1\times10^{3}} = 12 = \boxed{-12 \text{ mA}}$

عكس اتجاه التيار من 12V

$I'' = \frac{6}{(2//1)} = \frac{6}{\frac{2}{3}} = \frac{18}{2} = \boxed{9 \text{ mA}}$



$\therefore I' + I'' = -12 + 9 = \boxed{-3 \text{ mA}}$

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